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PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Improved Uncut Pile Fabrics

5 We, DEERING MILLIKEN RESEARCH CORPORATION, a Corporation organized under the Laws of the State of Delaware, United States of America, of P.O. Box 1927, Spartanburg, South Carolina, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 Absorbent cellulosic uncut pile fabrics are well known and are utilised in the manufacture of towels, towelling, terry cloth, bathrobes, beachrobes, and the like. It is desirable for such fabrics to have the highest possible absorbency, and greater absorbency is an objective which is constantly being sought by manufacturers of such fabrics.

20 A large percentage of absorbent cellulosic pile fabrics are made from inexpensive grades of cotton fibre, and generally such fibres are of relatively short staple length so that a relatively high degree of twist in the yarns used for manufacturing such fabrics is necessary for adequate strength. High twist yarns are otherwise undesirable in fabrics of this type because, as is well known, the higher the twist, other factors being equal, the lower the absorptivity of the yarn, and because a high twist in the pile yarns of a pile fabric imparts to the fabric a harsh hand which necessitates the application of a softener. Softeners are hydrophobic materials as a general rule, and the addition of a softener further decreases the water absorptivity of a cellulosic pile fabric to which it is applied. For these reasons, the absorptivity of pile fabrics made from short staple length fibre is generally much lower than is desired.

40 The absorptivity of a pile fabric can be increased by using long length staple, lower twist and less softening agent, but this generally makes the fabric more expensive, and in most instances the improvement is not considered to be worth the increase in cost. For

this reason, pile fabrics formed from long staple cottons are limited almost exclusively to the luxury trade.

50 It has now been found that an uncut pile fabric having an absorptivity in excess of even that of luxury fabrics can be produced by employing pile yarns which comprise a sheath of cellulose fibre encasing a hydrophobic, thermoplastic continuous filament core previously processed to impart an elastic nature thereto. That the absorptivity of a cellulosic fabric can be improved by incorporating hydrophobic yarns into the fabric is believed to be truly unexpected.

60 In addition to the advantage of higher absorptivity, fabrics according to this invention have several other important advantages. A first important additional advantage is that a pile fabric according to this invention has an exceedingly lofty nature and is noticeably thicker and bulkier than a corresponding fabric formed entirely from cotton yarns. This results in the fabrics having a luxury feel and appearance such as has been heretofore unobtainable. Another advantage is that the new fabrics display a springiness which is unknown in 100% cotton fabrics of a comparable weave and construction, and when the pile of a fabric according to this invention is crushed, it tends to return very rapidly and to a remarkable extent to its original upstanding position. In many instances, fabrics according to this invention are advantageous from the standpoint of cost of production in spite of the fact that a relatively expensive thermoplastic component is employed in the manufacture of the pile yarn. A first reason for this is that lower twist yarns can be employed so that at least a part of the expense of imparting twist can be avoided. A second reason is that a satisfactory hand is normally produced in fabrics according to this invention without the use of softening agents, and the omission of softening agents eliminates the cost of the chemical as well as the cost of

[Price 4s. 6d.]

application. Still another reason why a fabric according to this invention frequently has an advantage in cost as compared to a 100% cotton fabric is that the pile yarns employed according to this invention have greatly increased strength as compared to 100% staple fibre cellulose yarns, and this results in a large decrease in the frequency of yarn breaks during weaving.

The continuous filament yarn utilised as a core in the pile yarns employed in the manufacture of fabrics in accordance with this invention can be one which has been elasticised by any of the several techniques which are well known in the art, but an elasticised yarn is preferably selected which has a pronounced bulky nature when relaxed as well as stretch tendencies. This is because it has been found that the most desirable results are obtained when, under relaxed conditions, the thermoplastic core expands greatly in cross section and thereby expands the staple fibre sheath surrounding the core.

Examples of suitable yarns which can be employed as the core of the composite yarns used in accordance with this invention include yarns to which an elastic nature has been imparted by twisting, heat-setting, and untwisting techniques such as the yarns sold under the Registered Trade Marks of "Helanca" and "Saaba"; yarns elasticised by mechanically crimping, and heat-setting such as the yarns sold under the Registered Trade Mark "Ban Lon", and yarns elasticised by passing a thermoplastic yarn through an acutely angular path while at an elevated temperature such as yarns sold under the Registered Trade Mark "Agilon". Yarns of the latter type are much to be preferred.

The chemical nature of the elastic component of the composite yarn is relatively unimportant, and substantially any thermoplastic, continuous filament yarn to which an elastic nature can suitably be imparted by any of the above-mentioned procedures is satisfactory. Suitable examples include nylon yarns such as hexamethylene diamine-adipic acid yarns, polyester yarns such as those formed from polyethylene terephthalate, and acrylic yarns such as those formed from polymers of acrylonitrile. Specific illustrative examples of thermoplastic yarns which can constitute the core of a composite yarn employed in accordance with this invention include 15 denier, 3 filament, type 66 nylon; 40 denier, 13 filament, type 6 nylon; 70 denier, 34 filament Dacron polyester yarn; and 100 denier, 40 filament Orlon acrylic yarn (Dacron and Orlon are Registered Trade Marks). Generally a multi-filament core rather than a mono-filament core is preferred, for the reason that a plurality of filaments imparts additional bulk when the core yarn is in a contracted condition, and the small filaments assist by entanglement in securing the cellulose fibre in

position within the fabric. The continuous filament core can, if desired, be formed from two separate yarns, and in the case of torque elasticised yarns it is highly desirable for the elasticised core to comprise two strands having opposite torque tendencies. Likewise, the core can consist of a mixture of continuous filaments of different chemical natures and, for example, can comprise a blend of nylon and polyester filaments.

The cellulose fibres constituting the external surfaces of the pile yarns in fabrics according to this invention are preferably cotton fibres but can, if desired, be viscose rayon fibres or other regenerated or natural cellulose staple fibres. It is an advantage of this invention that very short length fibres can be employed without weakening the pile yarns to such an extent that they are unsatisfactory and, if desired, one can employ inexpensive grades of cotton fibres to produce a fabric having the appearance and absorbency characteristics of a prior cotton fabric made from premium grade materials. If desired, one can employ premium grade cotton fibres in the pile yarns of fabrics according to this invention and by doing so can produce a fabric of a quality and appearance heretofore unknown in absorbent cellulose pile fabrics.

Any suitable procedure can be employed for making the core yarn employed in forming a pile fabric according to this invention and, for example, a suitable apparatus and method for making core yarns is described in British Patent No. 636,682. This method permits one to vary the ratio of continuous filament to staple fibre material within wide limits, but for best results in accordance with this invention, the continuous filaments should seldom, if ever, constitute more than 50% of the weight of the core yarn. This is because the yarn must be composed of at least about 50% by weight of staple fibre material in order for the pile fabric to have a proper feel and appearance. There is no lower limit as to the percentage of filamentary material in the composite yarn, and frequently when the thermoplastic core constitutes as little as about 1% by weight of the yarn, a very definite improvement is obtained. For optimum results, however, the thermoplastic core should generally constitute from 10% to 25% of the weight of the composite yarn employed for the pile in a fabric according to this invention.

The amount of twist in the composite yarns used in accordance with this invention may be varied within reasonably wide limits and, for example, may be as little as 2 turns per inch or as much as 25 turns per inch, but best results are usually obtained if the twist in the composite yarn is from 8 to 15 turns per inch. This is because pile yarn twists above about 15 to 20 turns per inch result in fabrics having a relatively harsh feel

and a lower than necessary absorptivity, but if the amount of twist is below about 5 to 8 turns per inch, difficulties can be expected with shedding of the staple fibre material by the pile yarns. In instances when one is attempting to employ composite yarns with a minimum amount of twist, it is sometimes advantageous to apply to the core yarn an adhesive size under such conditions that the staple fibre sheath becomes adhered to the continuous filament core, but in most instances where yarns having a preferred amount of twist are employed, the yarns can be handled in a conventional manner.

The ground yarns in a fabric according to this invention can be of conventional constructions and for example, can be 100% cotton, 100% viscose, or any other suitable material or blend of materials. Likewise, the fabric can be of any suitable weave and, for example, can be either a warp pile or a weft pile fabric. In most instances, a fabric such as terry cloth is preferred although the advantages of the invention can be obtained with any towelling or towelling-like material.

The accompanying drawing is a fragmentary section of a terry cloth fabric made in accordance with this invention. The reference numerals 10 and 12 indicate ground warp and weft yarns respectively, and in this instance these yarns are conventional spun cotton yarns. The reference numerals 14 and 16 designate warp yarns which are in this instance core yarns containing an edge-crippled 70 denier, 34 filament nylon type 66 core which constitutes 20% by weight of the composite yarns and a cotton sheath of 7/8 inch cotton fibre which constitutes 80% by weight of the yarn. The twist in the pile yarns of this fabric is 15 turns per inch so that the pile loops are twisted to a noticeably lesser extent than is normal with conventional cotton pile yarns which, for adequate strength, must be relatively highly twisted. As a result of the relatively low twist and the elasticised thermoplastic core, the pile yarns,

in areas where they are unrestrained, have a bulky nature and are greatly expanded in cross sectional area as compared to points where they are restrained by the ground yarns.

The invention will now be further illustrated by the following example.

EXAMPLE 1

A terry cloth towel is woven using for the pile a core yarn equivalent in weight to a 15's and having as a core a 70 denier, 34 filament, edge elasticised, nylon type 66 yarn. The staple fibre sheath is of cotton fibres having an average staple length of 5/8 inch and the composite yarn is twisted 15 turns per inch.

For comparison purposes, an identical towel is woven except that for a pile yarn there is employed a 100% cotton 15's yarn of the same twist and formed from cotton of the staple length as in the core yarn above.

The same conditions are employed for the weaving of both of these towels and the only difference to be noted in weaving is substantially fewer warp yarn breaks when employing the core yarn. Both towels are of substantially the same size (48" by 29") and dry weight. Both towels are left in the greige and no softener is applied to either towel.

It is first noticed that there is an appreciable difference in the thickness of the two towels and the towel formed with the core yarn pile is about 25% thicker than the control. It is also noticed that the towel with the core yarn pile is much softer than the other and clearly needs little or no softener. It is further apparent that the towel having a core yarn pile is much more absorbent than the control but that it dries, based on actual water loss, at a more rapid rate than the control so that when both towels are saturated, they dry in about the same length of time.

The following table presents actual data derived from a test substantially according to this example:—

TABLE I

		Core Yarn Pile	100% Cotton Pile
95	Size - - - - -	48" x 29"	48" x 29"
	Thickness - - - - -	238—240 mils	184—188 mils
	Dry weight - - - - -	415 gms.	388 gms.
	Saturated wet weight - - - - -	1978 gms.	1527 gms.
	% Increase in wet over dry weight - - - - -	477%	394%

It will be noticed that the net difference in percent increase of wet over dry weight is 83% in favour of the towel having the core yarn pile.

WHAT WE CLAIM IS:—

1. An absorbent pile fabric having an uncut pile composed of yarns which comprise a filamentary thermoplastic stretch yarn core about which there is twisted, with not more

than 25 turns per inch of twist, a sheath of cellulose staple fibre, the staple fibre constituting at least 50% by weight of the pile yarns.

2. A fabric according to Claim 1 wherein the staple fibre is cotton.

3. A fabric according to Claim 1 or Claim 2 wherein the thermoplastic core yarn is nylon.

4. A fabric according to Claim 1 or Claim

- 2 wherein the thermoplastic core yarn is a polyethylene terephthalate yarn.
5. A fabric according to Claim 1 or Claim 2 wherein the thermoplastic core is formed from a polymer of acrylonitrile.
- 5 6. A fabric according to any of Claims 1 to 5 wherein the thermoplastic core yarn is an edge-crimped stretch yarn.
- 10 7. A fabric according to any of Claims 1 to 5 in which the thermoplastic core yarn has had stretch properties imparted to it by being passed through an acutely angular path while at an elevated temperature.
8. A fabric according to any of Claims 1 to 7 wherein the twist in the pile yarn is not more than 15 turns per inch.
- 15 9. A fabric according to any of Claims 1 to 7 wherein the twist in the pile yarn is from 8 to 15 turns per inch.
10. A fabric according to any of Claims 1 to 9 wherein the thermoplastic core constitutes from 10% to 25% by weight of the pile yarns.
- 20 11. A fabric according to Claim 1, substantially as described in this specification.

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COMPLETE SPECIFICATION

1 SHEET

*This drawing is a reproduction of
the Original on a reduced scale*

